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Markings observed on Uranus. By W. Buffham, Esq.

The writer, having observed certain appearances on this planet — usually deemed intractable to ordinary means — has complied with the suggestion of two eminent Fellows of the Royal Astronomical Society to ask permission to lay before it the results of his observations, accompanied by six sketches.* The telescope employed is a 9-inch With-Browning reflector, with achromatic eye-pieces.

1870, Jan. 25, at 11^h to 12^h, in clear and tolerably steady air. —Power 132 showed that the disk was not uniform. With powers 212 and 320 two round bright spots were perceived, not quite crossing the centre, but a little nearer the eastern side of the planet, the position-angle of a line passing through their centres being about 20° and 200°. Ellipticity of *Uranus* seemed obvious, the major axis lying parallel to the line of the spots. It is possible that irradiation may have been concerned in producing this impression. The limb of the western half of the disk gradually deepened from the centre to bluish near the limb, and the border all round was fainter than the spots. In the hours of observation I thought the southern spot had become less defined on the side nearest the south, and both rather nearer that limb of the planet.

Jan. 27, 10^h to 10$\frac{1}{2}^h$.—Some fog, and definition not so good; but the appearance of the spots was almost exactly as on the 25th.

Jan. 29, 8$\frac{1}{2}^h$.—Not very clear. I thought the eastern side a little brighter, but not certain. Same at 10$\frac{1}{2}^h$.

March 19, 8$\frac{1}{4}^h$ to 8$\frac{3}{4}^h$.—Definition not very good. Glimpses of a light streak in a similar position to the two spots first seen. At 10$\frac{1}{2}^h$ I thought there were traces of the spots. Ellipticity again noticed, and in the same direction.

April 1, 8^h.—A luminous zone certainly seen in the usual position; not of uniform breadth, but it bulged out in places. At 9^h and 10^h the latter feature less evident.

April 4, 8$\frac{1}{2}^h$ to 9$\frac{1}{4}^h$.—Clearer air. The bright zone plainer than on the 1st. One swelling suspected. At 11^h a similar appearance.

April 6, 9^h to 10^h.—Brighter portions of the zone more certainly perceived. The preceding side of the zone was darker than the general ground of the disk.

April 8 [time not noted].—Glimpses of the zone, but half-moon a few degrees distant.

Bad weather and other hindrances prevented further observations until—

1871, Dec. 27, 9$\frac{1}{2}^h$ to 10^h.—Persuaded that a brighter region crossed the disk. At times it appeared to take the form of a bright speck towards the south, with a less obvious portion towards the north, the general direction of the whole being from

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* These were exhibited at the Meeting.

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N. to S. Western side again observed to be of a deeper tint. Circumstances unfavourable to a rigid scrutiny.

1872, Feb. 20, $10\frac{1}{2}^h$ to $11\frac{1}{2}^h$.—Could not resist an impression that the part near S.E. limb was brighter than the rest, but the disk was too unsteady to make out definitely its form.

Feb. 21, 9^h.—Too unsteady to make out more than the southern side a little brighter.

March 6, $9\frac{1}{2}^h$ to 10^h.—In fine moments brighter portions S. and S.W. could be seen, but without well-marked form. N. side of the disk bluer.

March 9, $8\frac{1}{2}^h$ to 9^h.—Clear, and pretty steady definition. With powers 212 and 320 the S.E. side is certainly brighter than the general ground. There is also a dark line near the centre, running N. and S. At $10\frac{1}{2}^h$ to 11^h, the disk is more uniform in tint; the dark line not seen; near the S. limb slightly brighter than the rest.

At $11\frac{3}{4}^h$ to 12^h.—Nearly uniform. I think there is still a small brighter part on south preceding limb.

The observations of the last night seem to afford evidence of the rotation of *Uranus* in a similar direction to that indicated by the luminous spots and zone observed in 1870. If this be so, the plane of the planet's equator is not coincident with the plane of the orbits of his satellites. Nor need we be surprised at this departure from the general rule, where such an anomalous inclination exists. In singular confirmation of this (apparently) is Mr. Lassell's observation of 1862, Jan. 29, where he says, "I received an *impression*, which I am unable to render certain, of an equatorial dark belt, and of an ellipticity of form." (The direction is not given.) This would be remarkable if the equator of the planet coincided with the plane of the orbits of the satellites, which were at that time nearly square to the visual line. Assuming, however, the equator to have been near the node in Jan. 1870 (which seems indicated by my earlier observations), a rough projection will show that in 1862 the equator would be visible, though lying towards the western side, and ellipticity might therefore be perceived. The apparent discrepancy (so often quoted) between the results of Mädler and O. Struve is by this assumption reduced, if not entirely removed; for at the epoch of the latter observer (about 1850, I believe) the planet would be near its polar projection in 1849; while in 1842, when Mädler measured *Uranus*, it would be sufficiently distant to allow the equatorial protuberance to manifest itself. Referring once more to Mr. Lassell's observations on this point, he states that in 1852 he could not satisfy himself that there was any sensible ellipticity.

As to the period, anything more than a suggestion would seem to be mere assumption. But taking the appearances seen 1870, Jan. 25 and 27, as indicating the same face of the planet, together with the movement observed 1872, March 9, during

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about $3\frac{1}{2}$ hours, it will hardly be far from the truth to suppose *Uranus* rotates in a period of about twelve hours.

Gathering up these results as the merest approximations, we have,—

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Time of rotation	12 hours.
Inclination of equator ...	80°.
Long. of ascending node ...	110°.

Movement direct.

2 Princes Terrace, Bonner's Road, Victoria Park, E.,
Nov. 21, 1872.

On an Error in the Right Ascension of No. 3735 of Groombridge's Catalogue of Stars. By Edwin Dunkin, Esq.

The right ascension of this star as given in the Groombridge Catalogue is derived from eleven transits, and on this account it might be considered to be a well-determined value. The Astronomer Royal's attention has, however, been lately directed by M. Argelander to a disagreement between this value and that contained in several other catalogues, the difference being far too great and irregular to be accounted for by any proper motion of the star. From a comparison of Groombridge's R.A. for 1810, January 1, with the R.A. given in the catalogues of Fedorenko's Lalande, Armagh, Oeltzen's Argelander, the Radcliffe First Catalogue, and Greenwich (1872), reduced to the same epoch, the mean R.A. of Groombridge appears to be about three seconds too small.

At the request of the Astronomer Royal, I have made a searching examination of the original calculations of the Groombridge catalogue * with the object of discovering, if possible, whether any constant error affecting each observation had been inadvertently committed in the reductions. Unfortunately, in several instances, the calculations intervening between the original observations have never been found, and for one preliminary catalogue of about 900 stars, marked A, this is notably the case. This catalogue contains seven observations, made in 1809, from September 6 to October 8, out of the total number of eleven. The remaining four, made in 1812, are included in another preliminary catalogue, marked D, formed from later observations than those in A.

As none of the calculations intervening between the "Transit

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* The original manuscript observations and calculations have been deposited in the Society's Rooms since the publication of Groombridge's catalogue in 1838.